

STUDY ON FUNCTIONAL OUTCOME ANALYSIS FOLLOWING PRIMARY TOTAL KNEE REPLACEMENT WITH BUECHEL-PAPPAS KNEE

Sankaralingam P¹, Parthasarathy M.P², ThulasiRaman D³, Arul Vignesh⁴, Aravind MC⁵, Vijay MSV⁶

^{1,2,3,4,5,6}Department of Orthopaedics, Meenakshi Medical College and Research Institute, Kanchipuram, India

ABSTRACT

Background: Total knee replacement has arisen, with outstanding pain relief and work, as a safe, longer-lasting form of knee arthroplasty. The goal of this research was to examine the therapeutic, functional and radiological aspects of complete knee replacement with Buechel-Pappas knee Prosthesis for osteoarthritis and rheumatoid arthritis.

Material and Methods:

Material: Buechal Pappas spinning bearing prosthesis was implanted in all the surgeries.

Method: The study is a prospective study in which the Meenakshi Medical College & Research Institute from OCT 2016 to SEP 2018 included patients over 50 years of age who have primary knee osteoarthritis and those with rheumatoid arthritis knee who do not respond to conservative treatment. Both cases were implanted with Complete knee arthroplasty using the Buechel Pappas implant Distance balance procedure above the age range of 50yrs. Both patients have cases that do not lead to conservative management. Serious brain defects, poliomyelitis with muscle weakness, or knee joint sepsis were omitted from the study. The study involved 45 total knee replacements. Initially, both patients were judged by the American Knee Society Ranking. To come to a conclusion, pre and post-operative scores were compared. **Results:** In the American knee society ratings, there was a major change. The pre-operative average score was 27.44 and the post-operative score was 91.5. After the TKR, there was a 70% increase in the ratings. The average functional preoperative score was 34.6 and the postoperative score was 83.5, indicating a functional score improvement of 80 percent after TKR.

Conclusions: Total knee arthroplasty with Buechel-Pappas knee resulted in an increase in the patient's functional capacity to return to the pre-disease state, as demonstrated by the post-op society score improvement.

Keywords: Buechel- Pappas Leg, Arthroplasty of absolute leg, Osteoarthritis, knee society score (KSS)

AIMS AND OBJECTIVES

In the Department of Orthopaedics, Meenakshi Medical College & Research Institute, Kanchipuram, Tamilnadu, India, to study the scientific, practical and radiological dimensions of

complete knee replacement performed by Buechel Pappas.

INTRODUCTION

Osteoarthritis is age related, degenerative disease of the articular cartilage affecting more than 80% of people over the age of 55. OA in knee joint is very common in India ^[9]. As life expectancy increases, and the rate of obesity reaches epidemic proportions, OA has become increasingly common. The disease is progressive in nature ^[8] and advanced disease does not respond to conservative management. When the destruction is severe it does not respond to conservative treatment, requiring total knee replacement ^[3,4,6,7].

Rheumatoid arthritis is a systemic disorder of connective tissue more of auto-immune in nature where there is progressive synovium and articular surface involvement leading to destruction of joint. It does not lead to conservative care when the damage is serious, requiring complete reconstruction of the knee.

MATERIALS AND METHODOLOGY

The study is prospective study where in patients admitted to MMCH&RI from OCT 2016 to SEP 2018 were taken to consideration. All cases of tri-compartmental Osteoarthritis, and Rheumatoid arthritis not responding to conservative management were replaced with Buechel Pappas total knee arthroplasty. All the patients were above 50yrs of age. All the patients were initially evaluated using American Knee Society Score; Other variables like, Age of the Patient, Sex of the Patient, Deformity and Stage of Arthritis were documented. 45 total knee replacements which was done were taken up for study.

Inclusion Criteria

- Patients with severe pain not relieved by conservative management like NSAID's and Physiotherapy and Intra-articular steroid injection
- Patient with Primary Osteoarthritis with or without Valgus or Varus Deformity
- Patient with rheumatoid arthritis not responding to conservative management
- Patients willing to give consent for surgery

Exclusion Criteria

- Patients with sepsis of kneejoint.
- Patient with severe neurological deficit
- Patients of Serious Muscle Polio-Myelitis weakness
- Patients with local skin lesions.
- Patients who are not willing to give consent.
- Age <50

Scoring System

The knee society score was carried out by pre-and post-operative assessment (KSS)(Insall, 1989) ^[4], which is divided into three sections: a clinical knee score which In anteroposterior and medium-lateral directions, it measures pain, range of motion and equilibrium and has deductions for flexion contractures, extension latency and malalignment, to have a maximum score of 100 points; a functional score which assesses the ability to walk and ascend and descend stairs and deductions are made if patient needs ambulatory aids to walk, and has a maximum score of 100 points; patient categorization to explain how other physical conditions can affect the score.

Scores between 100 & 80 are excellent; between 79 & 70 are good; between 69 & 60 are fair and less than 60 are poor.

In radiological assessment alignment, femoral notching in lateral view and implant sizing were looked for. In view of the brief follow-up time, implant loosening was not examined in our research.

Surgical Procedures

Half an hour before surgery, both patients administered pre-operative broad-spectrum antibiotics. The patient was seated on the operating table under the effects of spinal or epidural anesthesia. All was done without a tourniquet. There was no use of suction drain, crepe bandage provided for tamponade effect.

Technique Overview

In this research, absolute knee arthroplasty (TKA) was conducted with careful attention to detail in a laminar flow operating theatre to avoid contamination of the procedure site. The knee joint is approached anteriorly through midline straight incision and medial parapatellar arthrotomy. PCL resection done in all cases^[1], (fig1).

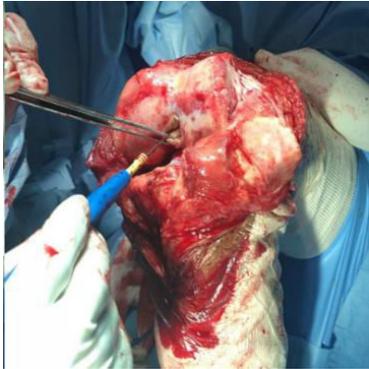
For Varus release Soft tissue releases were rendered before they surpassed the length of the lateral supporting structures through slow release of the close medial structures. The osteophytes were excised from the medial femur and tibia to facilitate release. Raise a sub-periosteal sleeve of soft tissue from the proximal medial tibia, comprising the deep medial collateral ligament, the superficial medial collateral ligament, with the knee in extension.

For valgus release knee is approached with medial Para patellar arthrotomy. Lateral osteophytes were removed. With the knee in extension pie crusting of iliotibial band done, release of gerdy's tubercle is done. Deformity in extension is corrected by the release of the lateral structures adequately.

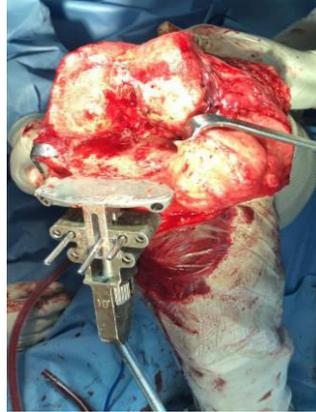
Tibial Cut and Sizing

Using an extra-medullary orientation rod, the proximal tibia is sliced perpendicular to the mechanical axis of the tibia with a posterior slope of 10 degrees. (Fig 2). After the cut, verification of the cut made with alignment rod. BP Knee instrumentation is designed to produce gap balancing. Stable rectangular flexion gap is created and then matched to produce stable rectangular extension gap, tensioning the collaterals in both positions. Femur sizing done as per the size of the Lateral Femoral Condyle (fig3). Intra-medullary entry point is made using antero posterior cutting jig selected as per the size of lateral femoral condyle reference (fig 4). In order to avoid notching of the anterior cortex, the alignment yoke slips across the anterior cortex. The intramedullary canal is opened and forced through the guide with a drill and then the rod is threaded through the entry point into the medullary canal. The Antero posterior Femoral Resection Guide is located over the distal femur and can rotate freely. Gap positioner is inserted into the horizontal slot over the lower portion of the AP resection guide at the same time knee is positioned at 90 degree. The lower flat surface of the gap positioner made to sit over the cut surface of the tibia. Few gentle blows with the light mallet given to seat the gap positioner perfectly. This manoeuvre tenses the collateral ligaments (Fig 5), produces proper external rotation of the AP resection guide to develop rectangular flexion gap which automatically sets the Parallel to the tibial slash, Posterior femoral resection, putting into equal tension of the collaterals. Femoral components external rotation is automatically correctly ensured in this

step. Flexion stability is now checked by rotatory movement of the tibia medially and laterally (fig 6).



(fig 1). PCL resection



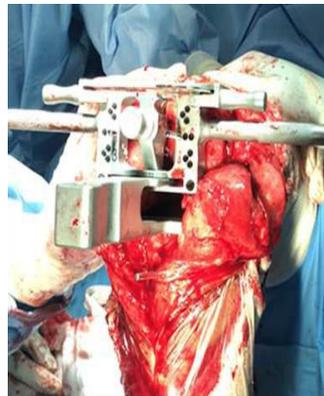
(fig 2). Tibial cut made perpendicular to mechanical axis with 10 degree posterior slope



(fig 3). Femoral condyle measured



(fig 4). Intramedullary entry taken



(fig 5). Collaterals are tensioned



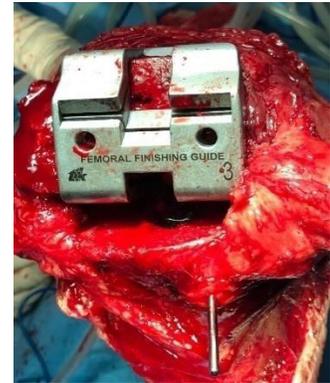
(fig 6). Alignment checked



(fig 7). Alignment rechecked



(fig 8) Distal femur cut



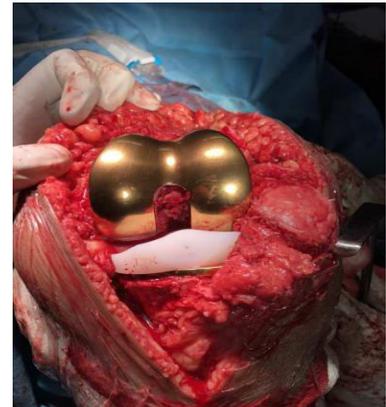
(fig 9). Final cut with high posterior cut



(fig 10). After the final cut showing minimal bone loss



(fig 11). Trial implantation



(fig 12). Final implantation

Tibial axis alignment is checked with the alignment rod before bony resection is made (fig 7). Now antero posterior resection is made after inserting the saw capture. Flexion gap is now checked after bony resection using the spacer block. Now through the intra medullary alignment rod distal femur valgus angle is chosen according to the Preoperative planning. (6 degree for a valgus and 3 degree for varus knee) The distal femur resection guide is pinned across the cut surface to the anterior surface of the distal femur. Same gap positioner is inserted into the distal cutting jig and the knee is extended so that the gap positioner. Seated over the cut surface of the

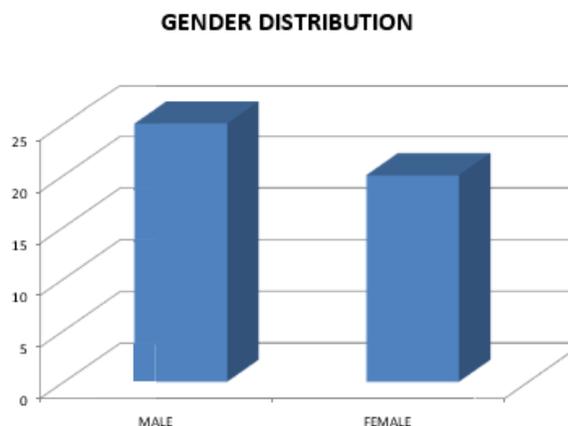
tibia, putting equal tension on the collaterals and produce a rectangular extension gap matching that of the previous flexion gap. extension stability is now checked with the gap positioner. So that the knee is stable even before the distal resection is made. now the gap positioner is removed. Alignment tower is introduced and the rod is inserted upward manner and so as to point the centre of head. Distal femur resection jig is placed and the distal femur cut is taken, (fig 8) Flexion and extension gap checked. Femoral Finishing cuts are made with the jig and for high flexion posterior condyle femoral cut is taken ^[10] (fig 9). Trial reduction done with chosen trial components and trial rotatory bearing stability is checked throughout the range of Movement and also the patello femoral tracking (fig 11). If there is laxity trial reduction is repeated with next size bearing Finally real components are cemented (fig 12).

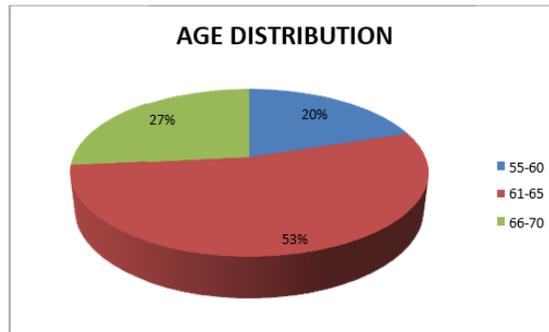
Postoperative Care

The patient undergoes recovery and experiences sufficient hydration and analgesia for a 24-hour duration. Antibiotic prophylaxis – 4 doses of Cefepime and Sulbactam used in all cases. After 24 hours, the patient mobilization is initiated. Under the care of a physiotherapist before release, they are persisted. On the second postoperative day the patient is allowed to walk. Of all patients, quality development is used in. Thromboembolism prophylaxis is started in 1st POD and continued for 25 days. Patient discharged on 4th post op day and advised to come as op patient on 12th post op day.

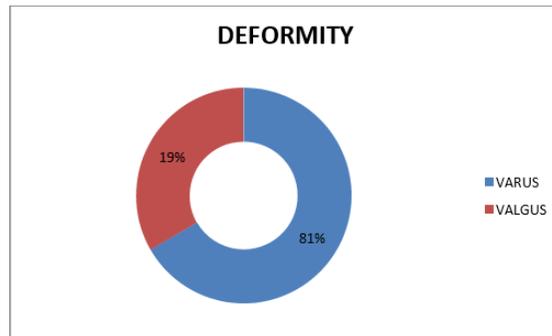
RESULTS

A total of 45 patients as shown in [20 women and 25 men] with a mean age of 62 years were operated on and monitored for up to 28 months of follow-up.



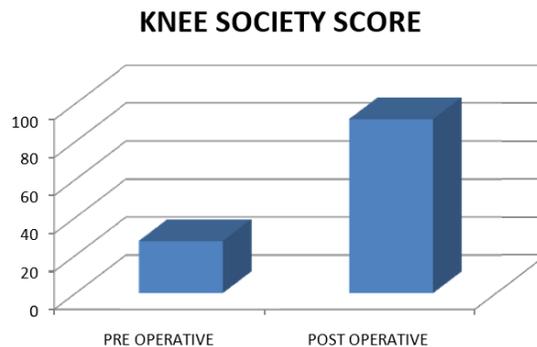


The above graph shows the age distribution of 45 patients in our study; nine patients ranged from fifty-five to sixty; twenty-four patients ranged from sixty-one to sixty-five; twelve patients ranged from sixty-six to seventy-five.



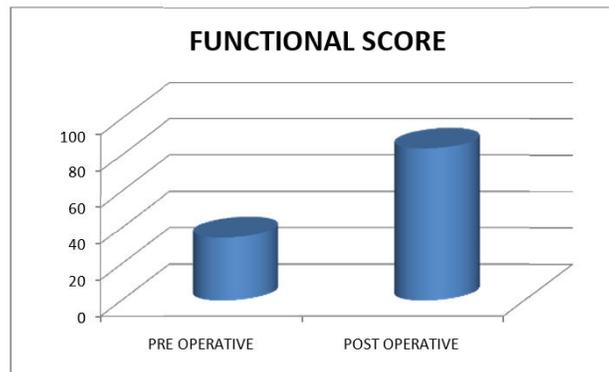
The patients in our study has been classified into two categories based on deformities, patients may have Varus and valgus deformities. Out of forty-five patients thirty-seven patients were found to have Varus, seven were found to have valgus.

PRE & POST OPERATIVE CLINICAL KNEE SOCIETY SCORE



Shows the pre-operative and post-operative Knee society scores for 45 patients

KNEE SOCIETY SCORE	MEAN	SD	MINIMUM	MAXIMUM
PRE OP	27.44	7.5	14	39
POST OP	91.15	8.4	67	99

PRE & POST OPERATIVE FUNCTIONAL AMERICAN KNEE SOCIETY SCORE

Shows the functional pre-operative and post-operative score of 45 patients

FUNCTIONAL SCORE	MEAN	SD	MINIMUM	MAXIMUM
PRE OP	34.66	10.5	20	50
POST OP	83.55	7.2	70	90

The patients who had exceptional outcomes were individually ambulant, used public transport and had pain relief. Patients were extensively asked on pain management, exercise level, endurance, and practical scoring. Patients were measured in the immediate post-operative phase and in the period after that period. As per the procedure described earlier, the patients were checked.

DISCUSSION

In all the patients, there is drastic pain relief and strong practical outcomes. In this study, knees affected with osteoarthritis or rheumatoid with the patient being clinically symptomatic, not responding to the usual conservative methods of treatment were taken up for surgery. Our inclusion criteria intended to involve and treat all the cases which justified a TKR, and the age mentioned was not necessarily the youngest age limit for all the etiologies. In our study the age of the youngest operated is 55 years in an osteoarthritic patient. No other etiology was observed in our study. It is observed that beginning early movement in the first 24 hours of surgery facilitates early mobilization and discharge from the hospital, as they were mobilized within 24 hours, both patients received a reasonable range of movements.

LCS Mobile bearing knee was introduced (1977) (designers were Beuchel and Pappas) with the idea of reducing polyethylene wear and improve survival. Callaghan et al., reported 97% survival at a minimum of 18 years (JBJS (2005)) in cemented knee and Buechel et al., reported 97.7% survival at 20 years in cement less knee^[15,16]. Hooper et al.^[5], proved Mobile-bearing complete knee replacement Low Contact Stress is a safe implant at 10 years as used in primary knee replacement regardless of deformity and diagnosis. Our patients saw a statistically meaningful improvement from an average of 27.44 to 91.14 in knee ratings, while the feature level rose from 34.86 to 85.55., demonstrating impressive outcomes compared to previous post-surgery trials.^[7]



To increase the surface area between the femoral portion and the polyethylene bearing, the B-P knee implant has been revamped, thus reducing the wear induced by partial contact. The risk of spin-out and dislocation of the polyethylene bearing and any danger of unnecessary rotation is minimised by the placement of the pin in front of the tibial part. Furthermore the reliability and longevity of femoral parts of ceramic coated titanium have significantly improved the life of the B-P knee implant. In this research, no dislocations of polyethylene implants occurred. If the knee arthroplasty procedure is done using the gap technique, the accuracy of tibial cutting significantly impacts the surgery. We have had positive outcomes from clinical and radiological tests using B-P knee implants for knee joint surgery. The group size could not have, however been sufficiently large and the follow-up time was not very long. In the future, a more developed study over a longer time is expected. In the American knee society ratings, there was a major change. The pre-operative average score was 27.44 and the post-operative score was 91.5. After the TKR, there was a 70% increase in the ratings. For the assessment of the scores, discomfort, range of motion and joint flexibility are taken into account and TKR has been found to greatly increase the scoring of the knee society. The average practical preoperative score was 34.6 and the postoperative score was 83.5, indicating an improvement of 80% after TKR.



Fig 13(a) Pre Operative –Anteroposterior View and– Lateral view
 Fig 13(b) Post Operative –Anteroposterior View and– Lateral view

CONCLUSION

Patients had pain relief which is often total, with an increased walking ability and stability of the joint. More than 95% of patients were on par with other global studies with a decent to outstanding score; ^[12] buechel-pappas knee replacement had an excellent outcome in degenerative and rheumatoid arthritis. Gap balancing technique by Buechel-Pappas knee system virtually eliminated flexion and extension gap imbalances. This also ensures perfect femoral component external rotation without relying on the bony landmarks (internal computer free navigation and its hazards). No Complication in our studies which we attribute to the early mobilization and use of low molecular weight heparin for DVT prophylaxis and thorough, preoperative work up, aseptic operating conditions and suitable antibiotics to prevent infection KSS scoring system is found to be relevant, simple but more exacting and more objective. We conclude that the primary total knee replacement by Buechel-Pappas knee system with gap balancing is a reliable and safe modality of treatment and can be performed in the osteoarthritis and rheumatoid arthritis patients.

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